Zeros of Polynomial Functions
Section 3.4

Learning Objectives:

1. Use the Rational Zero Theorem to find possible rational zeros.
2. Find zeros of a polynomial function.
3. Solve polynomial equations.
4. Use the Linear Factorization Theorem to find polynomials with given zeros.
5. Use Descartes's Rule of Signs.

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1. Use the Rational Zero Theorem to list all possible rational zeros for the given function.

$$f(x) = x^3 - 10x^2 + 4x - 8$$

List all possible rational zeros below.

2. Use the Rational Zero Theorem to list all possible rational zeros for the given function.

$$f(x) = 3x^4 - 7x^3 - 2x^2 + 5x - 6$$

List all possible rational zeros below.

3. The following function is given.

$$f(x) = 3x^3 - 7x^2 - 75x + 175$$

   a. List all possible rational zeros that are possible according to the Rational Zero Theorem. Choose the correct answer below.

b. Use synthetic division to test several possible rational zeroes in order to identify one actual zero.

c. Use the zero from part (b) to find all the zeros of the polynomial function.

4. Answer the following questions about the equation below.

$$x^3 - 34x - 12 = 0$$

a. List all the rational roots that are possible according to the Rational Zero Theorem.

b. Use synthetic division to test several possible rational roots in order to identify one actual zero.

c. Use the root from part (b) to solve the equation.

6. Use Decartes' Rule of signs to determine the possible numbers of positive and negative real zeros of $f(x) = 4x^4 - 9x^3 - 4x^2 - 7x + 6$.

   a. What are the possible numbers of positive real zeros?

   _____

   b. What are the possible numbers of negative real zeros

   _____

5. Use Decartes' Rule of signs to determine the possible numbers of positive and negative real zeros of $f(x) = x^3 + 3x^2 + 5x + 8$.

   a. What are the possible numbers of positive real zeros?

   _____

   b. What are the possible numbers of negative real zeros?

   _____

7. Find all the zeros of the polynomial function. Use the Rational Zero Theorem, Decartes's Rule of Signs, and possibly the graph of the polynomial function shown by a graphing utility as an aid in obtaining the first zero.

$$f(x) = x^3 - 3x^2 - 6x + 8$$

   a. The zeros of the function are

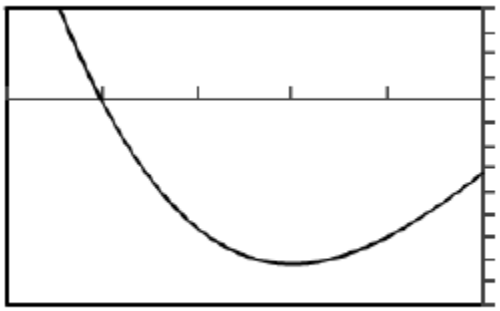
   _____.

8. Find all the zeros of the polynomial function. Use the Rational Zero Theorem, Decartes's Rule of Signs, and possibly the graph of the polynomial function shown by a graphing utility as an aid in obtaining the first zero or the first root.

$$f(x) = 3x^4 - 20x^3 + 14x^2 + 52x + 15$$

a. The zeros of the function are _____.
(Use Integers or simplified fractions.)

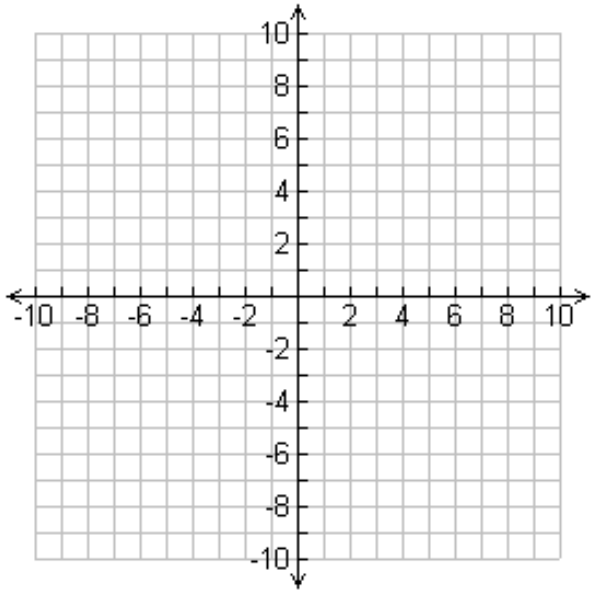
9. An incomplete graph of the polynomial function $f(x) = -x^3 - 2x^2 + 13x - 10$ is shown on the ~~right~~ below.



[-5, 0, 1] by [-45, 20, 5]

a. Find all the zeros of the function.
_____

b. Without using a graphing utility, draw a complete graph of the function.



Answer Key:

1.		$-1,1,-2,2,-4,4,-8,8$
2.		$-1,1,-2,2,-3,3,-6,6,-\frac{1}{3},\frac{1}{3},-\frac{2}{3},\frac{2}{3}$
3.	a.	$\pm1,\pm5,\pm25,\pm7,\pm35,\pm175,\pm\frac{1}{3},\pm\frac{5}{3},\pm\frac{25}{3},\pm\frac{7}{3},\pm\frac{35}{3},\pm\frac{175}{3}$
	b.	$\frac{7}{3}\ or\ 5\ or\ -5$
	c.	$\frac{7}{3},5,-5$
4.	a.	$\pm1,\pm2,\pm3,\pm4,\pm6,\pm12$
	b.	6
	c.	$6,-3+\sqrt{7},-3-\sqrt{7}$
5.	a.	0
	b.	3,1
6.	a.	2,0
	b.	2,0
7.		$1,-2,4$
8.		$5,3,-\frac{1}{3},-1$
9.	a.	$-5,2,1$
	b.